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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/026,469	12/27/2001	Charles A. Miller	2026.0030000	7774
27520	7590	01/06/2005	EXAMINER	
FORMFACTOR, INC. LEGAL DEPARTMENT 2140 RESEARCH DRIVE LIVERMORE, CA 94550			DATSKOVSKIY, MICHAEL V	
			ART UNIT	PAPER NUMBER
			2835	

DATE MAILED: 01/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/026,469

Applicant(s)

MILLER, CHARLES A.

Examiner

Michael V Datskovskiy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-8, 16, 17, 20, 21, 23-26, 32 and 33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 17, 20, 21, 25 and 26 is/are allowed.
- 6) ☐ Claim(s) 5-8, 16, 23, 24, 32 and 33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see Remarks, filed 11/29/2004, with respect to the rejection under 35 USC § 101 of the claims 5-8, 16-17, 20-21, 23-26 and 32-33 have been fully considered and are persuasive. The rejection under 35 USC § 101 of the claims 5-8, 16-17, 20-21, 23-26 and 32-33 has been withdrawn.
2. Applicant's arguments filed 11/29/2004 with respect to the rejection under 35 USC § 103 of the claims 5-8, 16, 32-33 have been considered but are moot in view of the new ground(s) of rejection.
3. Applicant's arguments filed 11/29/2004 with respect to the rejection under 35 USC § 103 of the claims 23-24 have been fully considered but they are not persuasive. Patel et al in Fig.5 clearly teach all surfaces of each dies 401 being directly cooled by the coolant. Therefore, the previous rejection under 35 USC § 103 of the claims 23-24 stays.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al (US Patent 6,184,065) in view of Patel et al (US Patent 6,550,263).

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Smith et al teach a cooling assembly, Fig.26, comprising: an electronic package having a cavity; a die 2 with active electronic components mounted using compliant interconnects-spring contacts 15 facing a bottom circuit board 14, wherein said spring contacts 15 comprise multiple layers of material and are formed using lithography.

Smith et al do teach furthermore said package comprising a heat radiator 50. Smith et al do not teach said package having a coolant port that allows a coolant to enter the cavity and directly cool the active electronic components of the die. Patel et al teach a cooling assembly comprising: an electronic package 405, Figs. 5-6, having a cavity 409; a plurality of dies 401; a bottom substrate 403, wherein active electronic components face the bottom surface 403 and an inert dielectric coolant (col.7, line 21) surrounding interconnects within the cavity 409; an inlet 411 and an outlet 413 coolant ports that allow the coolant to enter the cavity 409, wherein each die has at least one active surface associated with respective active electronic components, and when the coolant circulated in the cavity the coolant directly cools each active surface of each die 401. Patel et al teach furthermore said cooling assembly comprising a coolant circulation system coupled to said coolant ports 411 and 413, wherein the coolant circulates within the package 405 and directly contacts all surfaces of each die 401 to directly cool active electronic components during their operation. Patel et al teach furthermore said cooling assembly comprising a cooling member 509, Fig.6, and a heat radiator 507, wherein each die is immersed in the coolant and the heat radiator 507 transfers heat generated by the die 501 to said cooling member 509. It would have been obvious to one skilled in the art at the time invention was made to employ a cooling system shown by Patel et al

(using an inert dielectric fluid as a coolant) in the device by Smith et al in order to enhance a heat dissipation.

6. Claims 5-8, 16, 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al (US Patent 6,184,065) in view of Tilton et al (previously cited US Patent 5,719,444).

Smith et al teach a cooling assembly, Fig.26, comprising: an electronic package having a cavity; a die 2 with active electronic components mounted using compliant interconnects-spring contacts 15 facing a bottom circuit board 14, wherein said spring contacts 15 comprise multiple layers of material and are formed using lithography.

Smith et al do teach furthermore said package comprising a heat radiator 50. Smith et al do not teach said package having a coolant port that allows a coolant to enter the cavity and directly cool the active electronic components of the die. Tilton et al teach a cooling assembly, Figs.1-4, comprising: an electronic package 10; a plurality of dies 11; a bottom substrate 26, wherein active electronic components face the bottom surface 26 and an inert dielectric coolant surrounding interconnects within the cavity 18; an inlet 22 and an outlet 23 coolant ports that allow the coolant to continuously enter the cavity 18, wherein each die has at least one active surface associated with respective active electronic components, and when the coolant circulated in the cavity the coolant directly cools each active surface of each die 11. Tilton et al teach furthermore said cooling assembly comprising a coolant circulation system, Fig.4, coupled to said coolant ports 22 and 23, wherein the coolant circulates within the package 10 and directly contacts all

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surfaces of each die 11 to directly cool active electronic components during their operation. Patel et al teach furthermore said cooling assembly comprising a cooling member 509, Fig.6, and a heat radiator 507, wherein each die is immersed in the coolant and the heat radiator 507 transfers heat generated by the die 501 to said cooling member 509. It would have been obvious to one skilled in the art at the time invention was made to employ a cooling system shown by Patel et al (using an inert dielectric fluid as a coolant) in the device by Smith et al in order to enhance a heat dissipation.

Allowable Subject Matter

7. Claims 17, 20-21 and 25-26 are allowed.

8. The following is a statement of reasons for the indication of allowable subject matter: A combination of the structure claimed in claim 16, wherein said interconnects comprise first and second sets of compliant interconnects, the package further comprises a top substrate, and alignment posts attached to the bottom substrate (claim 17); The package further comprises a top substrate with a top surface representing an exterior surface of the package (claim 20); The package further comprises a top substrate, a bottom substrate and interconnection elements providing electrical path extending from the top substrate and the bottom substrate (claim 21); At least one non-contacting compliant interconnect coupled to a surface of said die, whereby heat can be further directed away from the surface of said die (claim 25); and The package further

comprises a top substrate, a bottom substrate, wherein each die is flip-chip bounded to said top substrate (claim 26).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael V Datskovskiy whose telephone number is (571) 272-2040. The examiner can normally be reached on 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2092. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Michael V Datskovskiy".

Michael V Datskovskiy
Primary Examiner
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01/04/2005